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Signed

Andrew Gentry

Dated

28th July 1999



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P01/7700 25.00 - 9813864.7

Request for grant of a patent

(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)

The Patent Office

Cardiff Road
Newport
Gwent NP9 1RH

1. Your reference

P22101/HGR/GMU

27 JUN 1998

2. Patent application number

(The Patent Office will fill in this part)

9813864.7

3. Full name, address and postcode of the or of each applicant (underline all surnames)

ERT Limited
Orkney Water Technology Centre
Flotta
STROMNESS
Orkney
KW16 3NP

Patents ADP number (if you know it)

If the applicant is a corporate body, give the country/state of its incorporation

United Kingdom

07465438001

4. Title of the invention

"Two Phase Liquid Media Coalescer"

5. Name of your agent (if you have one)

Murgitroyd & Company

"Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode)

373 Scotland Street
GLASGOW
G5 8QA

Patents ADP number (if you know it)

1198013

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (if you know it) the or each application number

Country

Priority application number
(if you know it)

Date of filing
(day / month / year)

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application

Date of filing
(day / month / year)

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? (Answer 'Yes' if:

- a) any applicant named in part 3 is not an inventor, or
- b) there is an inventor who is not named as an applicant, or
- c) any named applicant is a corporate body. See note (d))

Yes

Patents Form 1/77

9. Enter the number of sheets for any of the following items you are filing with this form
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Continuation sheets of this form

Description	6
Claim(s)	0
Abstract	0
Drawing(s)	1

10. If you are also filing any of the following, state how many against each item.

Priority documents	—
Translations of priority documents	—
Statement of inventorship and right to grant of a patent (Patents Form 7/77)	—
Request for preliminary examination and search (Patents Form 9/77)	—
Request for substantive examination (Patents Form 10/77)	—
Any other documents (please specify)	—

11. I/We request the grant of a patent on the basis of this application.

Signature

Murgitroyd & Co.

Date

26 June 1998

12. Name and daytime telephone number of person to contact in the United Kingdom

Graham Murnane
0141 307 8400

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Notes

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1 TWO PHASE LIQUID MEDIA COALESCER

2

3 This invention relates to a system for droplet growth
4 within a two phase liquid feed stream, particularly a
5 liquid phase stream comprising oil and water or solvent
6 and water. However, the invention is applicable to any
7 liquid feed stream in which there are at least two
8 different phases.

9

10 It has been observed that for a significant number of
11 processes which generate a two phase waste flow the
12 efficiency of liquid treatment plant is no longer
13 providing the desired level of phase removal. This, in
14 many instances, is due to the feed containing
15 relatively significant volumes of the minority phase in
16 the form of small droplets (eg typically of the order
17 of 10 μm or less). These droplets provide a challenge
18 for standard phase separation devices that are commonly
19 used.

20

21 Chemical flocculants, downstream skimmed enhancement
22 vessels, centrifuges or media filters have all been
23 considered as potential enhancement mechanisms to deal
24 with the problems of small droplets.

25

1 In many instances the cost or space required to utilise
2 such technologies is limited. If small droplets can be
3 coalesced or "grown" to a greater size, then the
4 existing equipment should perform in a more efficient
5 manner.

6

7 It is an object of the present invention to provide an
8 apparatus and method in which droplets in a two phase

9 ~~liquid feed stream can be coalesced to a greater size.~~

10

11 According to a first aspect of the present invention
12 there is provided an apparatus for coalescing droplets
13 of one phase from a liquid comprising two or more
14 phases, the apparatus comprising a chamber, a
15 coalescing medium having a surface area, means for
16 securing said coalescing medium within said chamber, an
17 inlet to said chamber, and an outlet to said chamber,
18 said inlet and outlet being positioned such that liquid
19 flowing from said inlet to said outlet flows in contact
20 with said surface area of said coalescing medium.

21

22 Preferably said coalescing medium has a high surface
23 area per unit volume. Preferably said coalescing
24 medium comprises a plurality of elongate members, most
25 preferably in the form of fibres. The fibres may be
26 substantially mutually aligned or may be randomly
27 orientated. Preferably the fibres are of natural, man
28 made or plastic material. The fibres may be
29 polypropylene, metal wire, animal hair, polyethylene,
30 polyester or glass wool. Preferably the coalescing
31 medium comprises one or more polypropylene ropes.

32

33 Preferably the chamber comprises a substantially
34 straight pipe having a first end and a second end, said
35 outlet being arranged at the first end and an access
36 cover being arranged at the second end. Preferably the

1 access cover is removable such as to allow access to
2 said coalescing medium. Preferably the chamber further
3 comprises a branch attached to an intermediate point of
4 said pipe, said inlet being arranged at the free end of
5 said branch.

6

7 Preferably the apparatus further comprises a retaining
8 member to which the coalescing medium is secured.

9 Preferably said retaining member is adapted to be
10 removably engaged within said chamber. Preferably the
11 interior of said chamber is provided with a lip adapted
12 to engage with said retaining member. Preferably said
13 access cover is adapted to hold said retaining member
14 against said lip when the access cover is attached to
15 the pipe. Preferably said retaining member is provided
16 with one or more apertures for securing said coalescing
17 medium to said retaining member.

18

19 According to a second aspect of the present invention
20 there is provided a method for coalescing droplets of
21 one phase from a liquid comprising two or more phases,
22 in which the liquid is caused to flow through a chamber
23 in which is secured a coalescing medium having a
24 surface area, such that the liquid flows in contact
25 with said surface area of said coalescing medium and
26 droplets of a phase of said liquid coalesce on said
27 surface area. Preferably the method uses an apparatus
28 according to the first aspect of the present invention

29 .

30

31 The present invention provides a simple process unit
32 which can either be added to a process system when the
33 system is constructed or be retrofitted into an
34 existing process system to increase the efficiency
35 and/or life of the process system. The coalescer
36 utilises additional surface area within the pipe to

1 assist the minority phase droplets to coalesce.

2

3 In one embodiment the apparatus of the invention
4 comprises a length of pipe fitted at each end with a
5 pressure sealable fitting (eg a flange plate, which can
6 be fixed to the pipe by welding, screw thread etc). At
7 one end of the pipe there is a "T" section fitted, with
8 another pressure sealable fitting (eg a flange plate,
9 again fixed by welding, screw thread etc). The

10 pressure sealable fitting on the pipe closest to the
11 "T" section is blanked off, and acts as a service and
12 inspection access point for the coalescing retainer and
13 media.

14

15 The coalescing media extends within the pipe through
16 the length of the unit and is retained by a retainer.
17 The media retainer may be of disk type construction,
18 and may have a number of drill holes therethrough to
19 allow the media to be attached. The retainer is
20 constructed from a stainless steel, or other suitable
21 material that will not be prone to corrosion or wear in
22 the environment under which this invention will have to
23 operate. The media retainer is secured in position by
24 appropriate means, for example by clamping between the
25 shoulder of the pipe and the screw fitting of the
26 blanketing plug, or by the retainer being restrained in
27 the pipe by a welded lip/shoulder and being held in
28 position by the flow of fluid around the media. It is
29 envisaged that the coalescing media will be made from
30 fibrous man-made or natural material such as
31 polypropylene rope, metal wire, animal hair,
32 polyethylene, polyester or glass wool.

33

34 To ensure that the coalescing media is correct for the
35 accumulation and thus the coalescing of the minority
36 phase this invention will allow for the coalescing

1 media to be fully interchangeable. The size and
2 dimensional shape of the coalescer will be dependent on
3 the flow characteristics (Reynolds Number) of the fluid
4 flowing through the apparatus. For example, if a high
5 Reynolds Number is required, a smaller effective cross
6 sectional area is required for the same flow. This
7 could be achieved by either reducing the pipe diameter,
8 or increasing the cross sectional area that is occupied
9 by the coalescing media. Typically the pipe may be
10 between 10mm and 100mm in diameter, although larger
11 pipes may be used.

12
13 A specific embodiment of the invention will now be
14 described by way of example with reference to the
15 drawings in which:

16
17 Fig 1 shows a schematic perspective view of an
18 apparatus according to one embodiment of the invention
19 indicating the location of the pressure sealable
20 fittings, with a partial cut away view showing the
21 coalescing medium inside the pipe; and
22

23 Fig 2 shows a longitudinal cross section of the
24 apparatus of Fig 1, indicating the construction of the
25 media retainer and the extent that the coalescing media
26 extends through the unit.

27
28 With reference to the drawings, the coalescer 10
29 comprises primarily a pipe 1 of suitable diameter to
30 allow for the required flow characteristics.

31
32 The coalescer 10 is fitted into the process
33 system/train by use of the pressure sealable fittings
34 2a, 2b.

35
36 Access to the coalescer media retainer 4 and media 5 is

1 achieved via the inspection and maintenance access
2 point 3. The media retainer 4 is secured in position
3 by the clamping action between the sealing device (ie
4 binding plate 6) and a shoulder 7 within the pipe 1.

5
6 The coalescer media 5 is attached to the media retainer
7 4 via a suitable method, depending on the media that is
8 used. If polypropylene rope is used for the media 5,
9 ~~connection is achieved by means of knots 8 tied in the~~
10 ends. The individual ropes or strands 9 of rope are
11 passed through preformed holes 11 in the media retainer
12 4, so that the knots prevent the rope from becoming
13 detached from the media retainer 4.

14
15 In use the two phase liquid enters the apparatus
16 through inlet 2a and passes along the pipe 1. The
17 large number of fibres in the coalescing medium 5 means
18 that there is a large surface area of the medium in
19 contact with the fluid as it passes along the pipe 1 to
20 the outlet 2b, encouraging the formation and growth of
21 droplets of the minority phase on the fibres.

22
23 When the coalescing medium needs to be replaced, the
24 binding plate 6 is unscrewed, the media retainer 4 can
25 be removed, a new medium 5 attached to the retainer 4,
26 and the retainer 4 reinserted in the pipe 1 and the
27 binding plate 6 screwed in. Alternatively both the
28 retainer and the media, preattached to the retainer,
29 may be replaced.

30

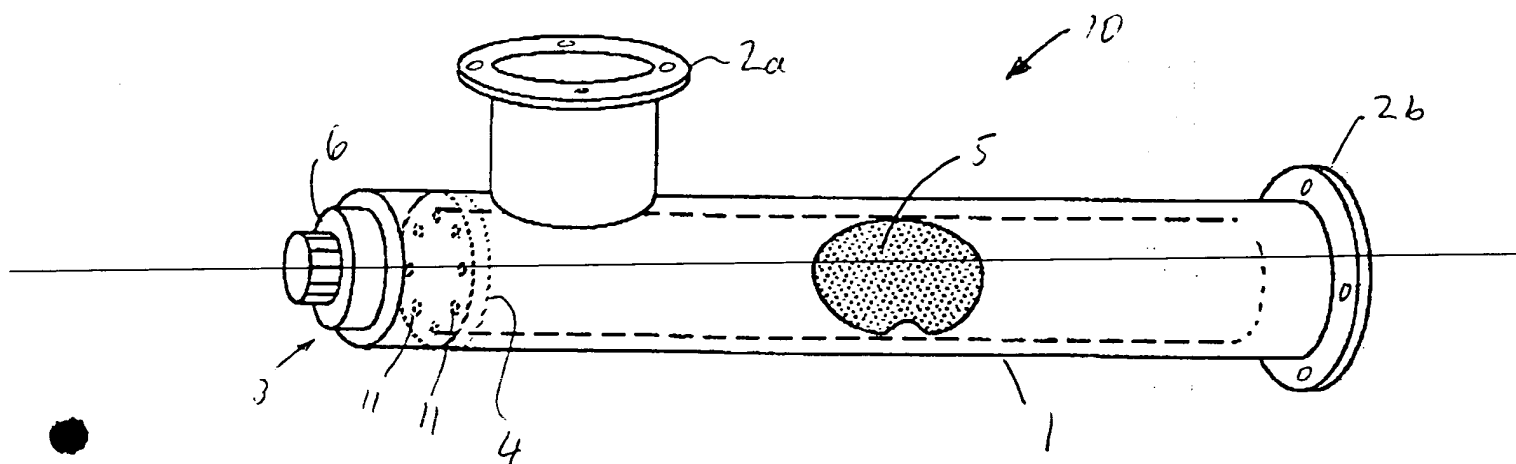


FIGURE 1

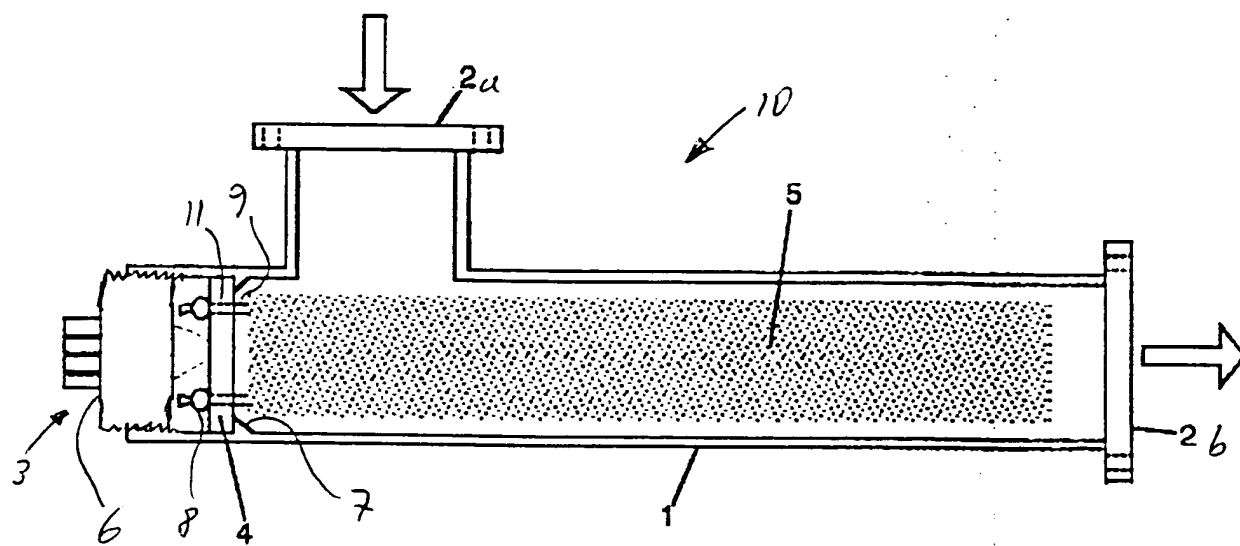


FIGURE 2

